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1. Introduction

This document assesses the impact of the Consensus Plan on the Canada / US arrangements and on Canadian operations.

The Federal Communications Commission (FCC) has published an NPRM and numerous Public Notices for comment periods regarding ways to improve Public Safety (PS) communications in the 800 MHz band. At the Radio Technical Liaison Committee (RTLCL) of January 2003, Industry Canada (IC) has agreed to look into the Canadian operations in the coordination zones, in the frequency bands 806-824 / 851-869 MHz, 762-764 / 792-794 MHz, 896-901 / 935-940 MHz, and 1910-1915 / 1990-1995 MHz. This spectrum is being proposed in the Consensus Plan.

2. Background

In November 2001, Nextel Communications Inc. submitted a white paper to the FCC for consideration on realigning the 800 MHz band to eliminate interference between Commercial Mobile Radio Services (CMRS) and Public Safety (PS) users.

In view of the fact that PS communications in the 800 MHz band are receiving harmful interference, the FCC issued a Notice of Proposed Rule Making (NPRM) to explore ways to improve the spectrum environment for PS in this particular band. After the comment period, there was simply a lot of disagreement on how to resolve the interference.

In August 2002, Nextel, the Private Wireless Coalition (PWC) and PS Community reached a consensus on mitigating interference in the 800 MHz band. This joint filing represents more than 80 percent of the licensees in this band. It offered an effective long-term solution to resolve PS interference, correcting the interleaved spectrum situation while minimizing disruption to licensees, funding to support the relocation, and creating more spectrum for PS. The industry still had many concerns with the proposed plan.

On December 24 2002, the Consensus Parties submitted an additional report to the FCC addressing funding issues, procedures and processes for relocating 800 MHz incumbents, interference protection standards, and a border region plan.

Industry Canada has many sharing arrangements with the FCC concerning the use of the spectrum along the Canada / US border. Therefore, the Consensus Plan will certainly impact numerous agreements which IC has with the FCC. A lot of Canadian licensees are depending on those arrangements for their everyday operations.

3. 800 MHz Band

Many terrestrial agreements and arrangements are currently referred to for assignments in the 800 MHz band. Arrangements involved for 800 MHz operations along the border area are: 806-890 MHz band, 806-821 / 851-866 MHz band, and 821-824 / 866-869 MHz band. The Consensus Plan will affect a variety of issues in each agreement.

3.1 Canadian Operations in the Coordination Zones

In order to have equitable access to spectrum along the Canada/US border, Industry Canada and the Federal Communications Commission have implemented special sharing arrangements¹ for frequencies between 806-824/851-869 MHz. Three Sharing Zones and two Sectors were created to consider the different demographic situations, and in each area, frequency blocks were assigned to each Country for unrestricted geographic use².

Licensees assigned in primary spectrum (unrestricted geographical use of the spectrum) are able to operate free of harmful interference from the other Country. However, in secondary spectrum (use of the other Country's primary spectrum, and licensees are restricted on a Power Flux Density signal level at the border), all licensees are on a no protection non-interference basis from operators of the other Country.

3.1.1 Sharing Zones I, II & III

Canada is sharing each zone equally with the US. They each have 18 MHz of primary spectrum per zone. Sharing Zones I & III extends to 100 km from the border and it is followed by a protection zone of 40 km. Sharing Zone II extends to 140 km from the border and it has no protection zone.

3.1.2 Sector I

Canada has 9.9125 MHz of primary spectrum, while the US has 26.0875 MHz of primary spectrum. Sector I is part of Sharing Zone I.

3.1.3 Sector II

Canada has 25.2125 MHz primary spectrum, while the US has 10.7875 MHz primary spectrum. Sector II is part of Sharing Zone I.

¹ Sharing Arrangements and Canadian standards are in Annex A

² Refer to Annex B for Canada / US 800 MHz coordination zones map

In order to assess the impacts on Canadian operations in the coordination zones, a study on the use of the spectrum was carried out and the following is the summary of the results ("Licensees" is defined as Canadian people who are holding a spectrum license, "Spectrum Occupied" is the number of different channels (25 kHz) belonging to a licensee multiplied by the bandwidth, "Spectrum Used" is the total number of channels (25 kHz) belonging to a licensee multiplied by the bandwidth).

Public Safety Licensees for each Coordination Zone

	Licensees involved	Total Spectrum Occupied	Total Spectrum Used
Sharing Zone I	16	2.925 MHz	4.175 MHz
Sharing Zone II	25	5.775 MHz	17.75 MHz
Sharing Zone III	-	-	-
Sector I	10	3.1 MHz	7.625 MHz
Sector II	138	40.7 MHz	200.075 MHz

Non Public Safety Licensees for each Coordination Zone

	Licensees involved	Total Spectrum Occupied	Total Spectrum Used
Sharing Zone I	22	9.05 MHz	15.5 MHz
Sharing Zone II	10	1.775 MHz	6.15 MHz
Sharing Zone III	1	0.175 MHz	0.175 MHz
Sector I	23	3.85 MHz	10.225 MHz
Sector II	22	7.475 MHz	17.825 MHz

IDEN Operators for each Coordination Zone

	Licensees involved	Total Spectrum Occupied	Total Spectrum Used
Sharing Zone I	2	2.975 MHz	3.2 MHz
Sharing Zone II	2	4 MHz	26.675 MHz
Sharing Zone III	-	-	-
Sector I	2	2.925	12.1 MHz
Sector II	2	8.9 MHz	192.225 MHz

Sector II is a very important Canadian coordination zone. PS and IDEN systems are each using more than 190 MHz of spectrum. Two Cellularized operators are using more than 350 channels, 138 PS users are using around 1600 channels, and 22 Non PS operators are using nearly 300 channels.

Sector I is almost equally shared between the three different kinds of operators. Roughly, they are each using above 120 channels and they are all using around 10 MHz of spectrum.

Sharing Zone I is the biggest coordination zone but it has less operators than the two sectors. Approximately, PS has 117 channels, Non-PS has 362 channels, and IDEN cellular providers are using 119 channels. Non-PS licensees are the biggest users with 15.5 MHz of spectrum, followed by PS at 4 MHz and IDEN incumbents at 3 MHz.

Sharing Zone II is mainly occupied by cellular and PS licensees. Low-site system providers are using 160 channels and nearly 27 MHz of spectrum. PS incumbents are using around 230 channels and approximately 18 MHz of spectrum.

Sharing Zone III only has one Non-PS operator, who has 7 channels and is using 0.175 MHz of spectrum.

3.2 Mutual Aid Channels

Within the band 821-824 / 866-869 MHz allocated for Public Safety, Mutual Aid channels were identified for sharing between agencies of the two Countries along the Canada / US border. These five channels are used for PS communication and are essential during an emergency response close to the border.

Since the Consensus Plan proposed a new frequency band for PS, the Mutual Aid channels will no longer be part of the US Public Safety spectrum block, which will be redesign for low-site, low power licensees. All US PS users are relocating to the lower portion of the 800 MHz band. The Consensus Parties recognize that modifications to the Mutual Aid channels may be required. New channels need to be negotiated. This will create major disruptions in the operation of systems along the border.

Canadian PS users currently operating on existing Mutual Aid channels may need to purchase new equipment because their current equipment can't be retuned to the lower portion of the 800 MHz band. Canadian licensees who are operating on a Power Flux Density (PFD) basis, may be required to move because the Consensus Plan must clear incumbents for the newly assign Mutual aid channels.

3.3 Impacts on CAN / US Special Sharing Arrangements

Industry Canada has an arrangement with Region 55 and the New York State Police regarding the shared use of the 823.1125-824/868.1125-869 MHz band, for a 30 km radius around the Kitchener-Waterloo Ontario area³. This region is considered to be in the protection zone, in which Canada has full use of the spectrum but is limited to certain restrictions. IC clients involved include the Region of Waterloo Police, Fire, and a multitude of other municipal users. The Consensus Plan will reallocate the 823.1-824/868.1-864 MHz block for cellularized operations. This reallocation will increase the potential of harmful interference for our Canadian Waterloo clients.

A similar arrangement was made between IC and the FCC regarding the shared use of a multitude of channels between 823.1125-823.9875/868.1125-869-9875 MHz in the Niagara and Erie area.

Industry Canada has another arrangement with Region 21 (State of Michigan) and Region 33 (State of Ohio) regarding the shared use of spectrum between 821.4625-823.0875/866.4625-868.0875 MHz, for a 30 km radius around London, Ontario⁴. Channels were successfully coordinated to control interference from the other Country's stations. The reallocation of licensees out of this spectrum block will certainly affect this arrangement and may cause some concerns to many IC users. Canada's primary client is the London Police Department.

3.4 Impacts on Telus / Nextel Arrangement

Telus and their US counterpart, Nextel, agreed to a business arrangement to coordinate and use a limited number of primary frequencies within 100 km of the Canada / US border⁵.

Nextel intends to move all their frequencies out of the non-cellularized block. Subsequently, the special coordination procedure that they have with Telus will no longer be compatible with the Consensus Band Plan. New channels will have to be negotiated. Also, the reallocation of US cellular operators will increase the potential of harmful interference for Canadian licensees. In total, 446 channels are currently being shared between the two cellular providers. 177 channels are in the non-cellularized zone and 269 channels are in the cellularized zone.

³ Refer to Annex A for LM Arrangement in the Bands 821-824/866-869 MHz and SRSP 502

⁴ Refer to Annex A for LM Arrangement in the Bands 821-824/866-869 MHz and SRSP 502

⁵ Refer to Annex A for Special Coordination Procedure for the 806-821 / 851-866 MHz band

3.5 Impacts on PFD Licensees in Coordination Zones

Industry Canada and the FCC have established different coordination zones for the shared use of the 800 MHz band along the Canada / US border⁶. Certain restrictions on the transmit power and the maximum antenna height allowed were implemented to better protect licensees from interference.

Many US licensees are using channels on Canadian primary spectrum in the coordination zones. Depending on the effective antenna height and the different coordination zone, the US PFD signal level permitted at the border can vary between -84 & -107 dBw/m². In the Pacific Region, it seems that the -107 dBw/m² value does not provide adequate protection for Canadian licensees. US stations located outside the coordination zone are causing interference problems to Canadian operators. The Consensus Plan will relocate US licensees because of the new proposed band plan. Therefore, it will potentially create new reports of harmful interference to our Canadian licensees.

3.6 US New Spectrum Blocks in Border Area

The Consensus Plan will relocate US cellularized incumbents to the upper portion of the 800 MHz band and US non-cellularized incumbents, including Public Safety, to the lower portion of the 800 MHz band. This change is also considered along the Canada / US border.

In the border regions, there are limited numbers of primary channels available to the US. Therefore, two discrete frequency bands were proposed to satisfy the demand for cellular operations. In each coordination zone, US spectrum blocks will be positioned in the middle of the Canadian primary spectrum block⁷. In Canada, this spectrum is allocated to PS. As a result, there will be major concerns for Canadian licensees who are operating on adjacent channels to the US primary frequency bands. The current US 800 MHz scenario can reproduce itself in the border area. It is very important that Canadian PS licensees are not affected by the US realignment process.

⁶ Refer to TRAA in Annex A

⁷ Refer to Annex C for Border Realignment Plan

4. 700 MHz Band

Nextel offered its 700 MHz spectrum (762-764/792-794 MHz) for PS uses. In Canada, this spectrum in the 700 MHz band is currently allocated for broadcast TV. However, Industry Canada is presently working towards a proposal to introduce mobile service on a co-primary basis with the broadcasting service in the frequency band 764-776 / 794-806 MHz (TV channels 63-64 / 68-69)⁸.

At this time, there is no arrangement available between Canada and the US concerning land mobile uses in the 700 MHz band. A new arrangement is currently in discussion for a PS spectrum sharing block at 764-776 / 794-806 MHz. Presently, Canada has no plan to allocate the 762-764 / 792-794 MHz band for land mobile services.

5. 900 MHz Band

Members of the Consensus Plan are looking at options to clear additional spectrum in the 800 MHz band. One solution was to give an opportunity to incumbents to voluntarily relocate to the 900 MHz band for extra bonus channels. In the border region, the coordination process will be very important to ensure that no interference is taking place.

There is presently an arrangement between Canada and the US for the uses of the 896-901/935-940 MHz band⁹. This arrangement is very similar to the 800 MHz arrangement where sharing zones and sectors are established. Stations in the coordination zones are subject to certain restrictions on effective antenna heights and PFD values. Because of the relocation of licensees to the 900 MHz band, this cross border agreements may have to be re-examined.

⁸ Refer to Annex A for Gazette Notice DGTP-004-01

⁹ Refer to Annex A for 896-901/935-940 MHz Terrestrial Arrangement

6. 1.9 GHz Band

The Consensus Plan will give Nextel 10 MHz of PCS spectrum at 1.9 GHz. Industry Canada has not received any request to look at such an option. The 1910-1915 MHz block is part of the spectrum allocated to license-exempt PCS and the 1990-1995 MHz block is part of the spectrum allocated to Mobile Satellite Service (MSS).

IC and the FCC agreed that the coordination zone for all PCS systems in the 1850-1990 MHz band is 120 km from the border. If there is interference caused by a PCS provider beyond 120 km, both administrations agreed to take the appropriate steps to resolve the interference. Also, all PCS base stations must not exceed 47 dBuV/m at or beyond the border¹⁰. Furthermore, in the 1850-1990 MHz arrangement, it clearly indicates that the 1910-1930 MHz spectrum block is set apart for unlicensed PCS in the US and License-exempt PCS in Canada.

IC adopted the Region 2 recommendations to allocate the MSS uplink in the 1990-2025 MHz band¹¹. New PCS operations in the 1.9 GHz band will certainly affect the MSS and PCS license-exempt spectrum. Therefore, a new arrangement must be negotiated between the FCC and IC to allow US PCS providers to operate between 1910-1915 MHz and 1990-1995 MHz along the US border area, and to permit PCS operation in the same band as Canadian licence-exempt PCS and MSS.

¹⁰ Some exceptions may be applied. Refer to Annex A for the Interim Sharing Arrangement between IC and the FCC Concerning the Use of the Band 1850 to 1990 MHz.

¹¹ Refer to Annex A for the Microwave Spectrum Policies in the 1-3 GHz band, Section 5.0

7. CAN Regional Reports on 800 MHz Interference

A number of Canadian licensees are experiencing interference problems in the 800 MHz band when they are operating close to a base station which uses cellular technology. Regional studies were done to determine the problems and the impacts on the affected high-site high-power users. Intermodulation, noise, and receiver overload were identified as the primary reasons for interference cause to non-cellular licensees. In each report, it was recommended to refer to "The Best Practice Guide" to resolve the 800 MHz interference problems.

In Canada and in the US, most Public Safety users have limited resources. They are holding communications costs to a minimum. Their equipment and systems are not state of the art. Thus, their mobile units are subject to more interference because their radios have less interference rejection than most modern radios, and most systems employed are noise-limited systems. On the other hand, cellular systems are designed to reuse frequencies in an area to increase the capacity of their systems. Each system has a large number of base stations in the operating area. Careful planning of cellular systems can minimize interference because every cell has a strong receive signal level. Cellular systems are considered to be interference-limited rather than noise-limited.

At any location close to a cellular base station, PS incumbents are subject to a relatively strong interfering signal level. Therefore, PS users are not able to establish communication with their own base station.

The following recommendations were adopted in the conclusions of the Canadian 800 MHz Regional Reports on interference to non-cellular systems. PS incumbents should consider improving their C / I ratios¹² in their cores areas to increased the desired signal level. All radio equipment should improve their intermodulation rejection to be greater than 70 dB. Advance planning and frequency coordination between the two distinct systems are very critical to prevent interference. A swap of frequencies, among the affected parties involved, to prevent interleaved, will reduce the probability of interference.

It has been proven in the past that the "The Best Practice Guide" is an essential tool to resolve interference. Changing band plans will bring some uncertainties to users. It has not been proven that the creation of two distinct spectrum blocks will put an end to the current interference scenario in the 800 MHz band.

¹² Ratio of the Carrier signal level over the Interfering signal level

8. Discussion, Conclusion

The Consensus Plan did consider changes to the terrestrial agreements but did not address how to effectively realign the 800 MHz band in the Canada / US border regions.

Terrestrial arrangements will have to developed or reviewed. Canada will have a different 800 MHz band plan than the US. Canadian PS users are in the upper 800 MHz band, while US PS are moving in the lower part of 800 MHz band. Interoperability between PS operations of both Countries will not be achieved, and PS operations in the border area will be compromised. The Mutual Aid channels can't be part of the new US cellularized band. Therefore, new channels will need to be agreed upon. Relocation of Canadian incumbents who are currently using those Mutual Aid channels have to be considered. New equipment will need to be purchase because not all equipment can be retuned.

The Consensus Plan has set up a 2x2 MHz guard band for the majority of the US, the Mexican border area is provided with a maximum of 1x1 MHz guard band in certain areas, and the Canadian border is offered no guard band. This will certainly increases the likelihood of harmful interference to Canadian incumbents.

The Consensus Plan does not address Out Of Band Emission (OOBE) interference in the border regions. If there are no additional restrictions on cellular providers, the current US 800 MHz interference situation might not be resolve in the border areas, and even worst, it can cause interference.

The relocation of the US NPSPAC block will definitely raise the probability of harmful interference. These high-site high-power systems, which are operating on channels adjacent to Canadian primary spectrum, will be source of interference.

The Consensus Plan will protect non-cellular licensees from interference provided that the signal from the base station to the mobile unit, in the affected area, reaches a minimum signal level requirement. However, if operators increase their transmit power with the intention of attaining the signal strength requirement, there is a chance that they will no longer meet existing terrestrial agreements with Canada. There are restrictions on the maximum TX ERP level allowed and limits on effective antenna heights in the coordination zones.

The proper use of the “The Best Practice Guide” will help to resolve PS interference in the 800 MHz band. There is no need to create a cellular and non-cellular spectrum block if the proper receiver standards are used, and if frequencies are assigned and coordinated properly.

In conclusion, the Consensus Plan will affect Canadian licensees in the border regions. The relocation of US high-site, high-power users and cellular operators in the US 800 MHz band will cause some concerns to IC licensees. It is critical that Public Safety has the amount of spectrum it needs on both sides of the border, to effectively operate and to protect the lives of all citizens of both Countries.

Annex A

TRAA & Other IC Documents

800 MHz Spectrum

- Land Mobile Radio Services Operating in the Band 806-890 MHz (<http://strategis.ic.gc.ca/pics/sf/land806e.pdf>)
- Addendum to Interim Arrangements Concerning the Use of Certain Frequency Bands in the Range 806-960 MHz (<http://strategis.ic.gc.ca/pics/sf/add806e.pdf>)
- Special Coordination Procedure for the Use of Frequencies in the Bands 806-821 MHz and 851-866 MHz for Land Mobile Services (<http://strategis.ic.gc.ca/pics/sf/806-821e.pdf>)
- Land Mobile Service Operating in the Bands 821-824 MHz and 866-869 MHz (<http://strategis.ic.gc.ca/pics/sf/821-869e.pdf>)
- Technical Requirements for Land Mobile and Fixed Radio Services Operating in the Bands 806-821 / 851-866 MHz and 821-824 / 866-869 MHz (SRSP-502) (<http://strategis.ic.gc.ca/pics/sf/srsp502.pdf>)

700 MHz Spectrum

- Proposal to introduce mobile service on a co-primary basis with the broadcasting service in the frequency band 746-806 MHz (TV channels 60-69); Gazette Notice DGTP-004-01 (<http://strategis.ic.gc.ca/pics/sf/746-806e.pdf>)

900 MHz Spectrum

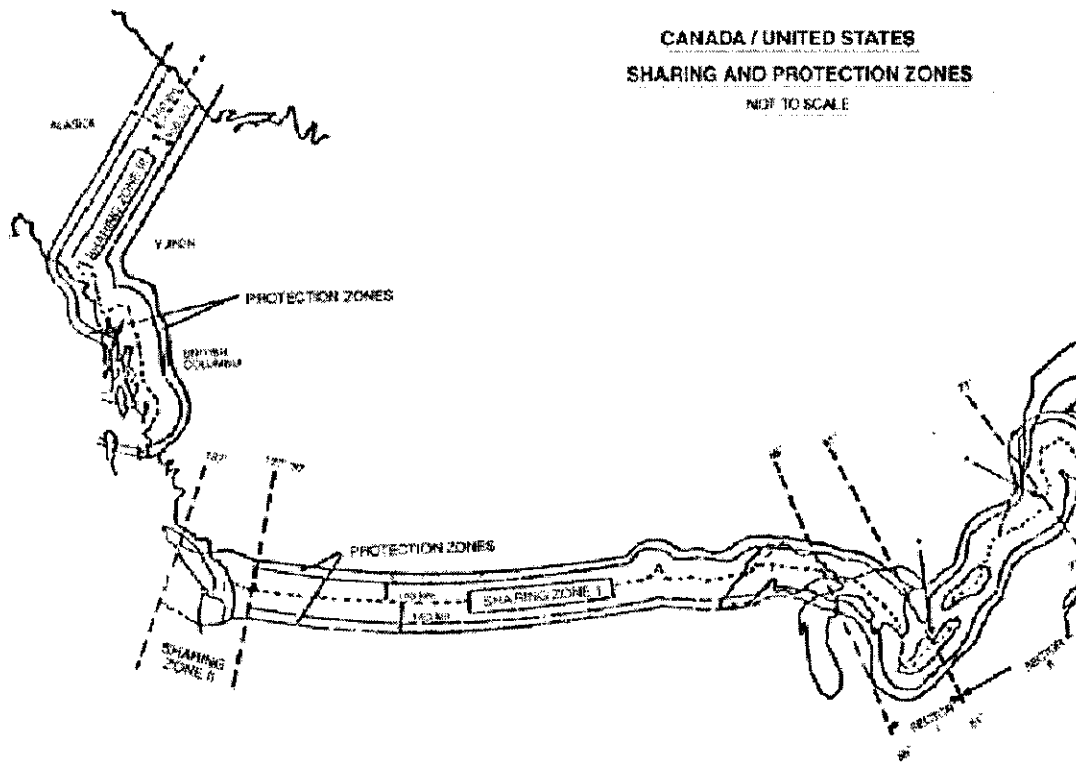
- Technical Requirements for Land Mobile and Fixed Radio Services Operating in the Bands 896-901 MHz and 935-940 MHz (SRSP-506) (<http://strategis.ic.gc.ca/pics/sf/srsp506.pdf>)
- Land Mobile Service Operating in the Bands 896-901 MHz and 935-940 MHz (<http://strategis.ic.gc.ca/pics/sf/896-940e.pdf>)
- Addendum to Interim Arrangements Concerning the Use of Certain Frequency Bands in the Range 806-960 MHz (<http://strategis.ic.gc.ca/pics/sf/add806e.pdf>)
- Spectrum Utilization Policy for the Fixed, Mobile, Radiolocation and Amateur Services in the Band 896 - 960 MHz (SP 896 MHz) (<http://strategis.ic.gc.ca/pics/sf/sp-896.pdf>)

1.9 GHz Spectrum

- 2 GHz Licence-Exempt Personal Communications Service Devices (PCS) - (RSS-213) (<http://strategis.ic.gc.ca/pics/sf/rss213.pdf>)
- Interim Sharing Arrangement between Industry Canada and the Federal Communications Commission Concerning the Use of the Band 1850 to 1990 MHz (<http://strategis.ic.gc.ca/pics/sf/1850e.pdf>)
- Licence Exempt Personal Communications Services in the Frequency Band 1910-1930 MHz (SP 1910) (<http://strategis.ic.gc.ca/pics/sf/sp1910.pdf>)
- Amendments to the Microwave Spectrum Utilization Policies in the 1-3 GHz Frequency Range (SP 1-3 GHz), Section 5.0 (<http://strategis.ic.gc.ca/pics/sf/sp1-3.pdf>)

Annex B

Canada / US 800 MHz Coordination Zones

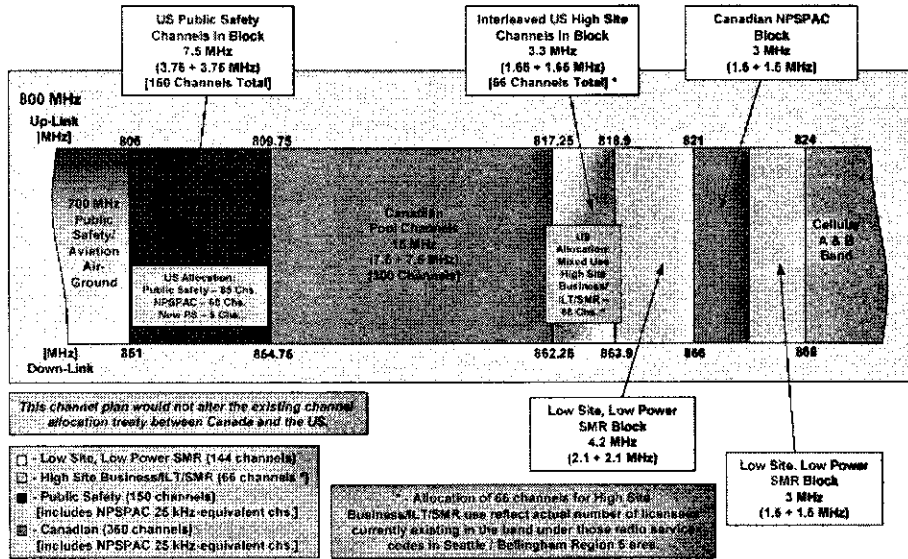


Graph taken from TRAA documents in Annex A

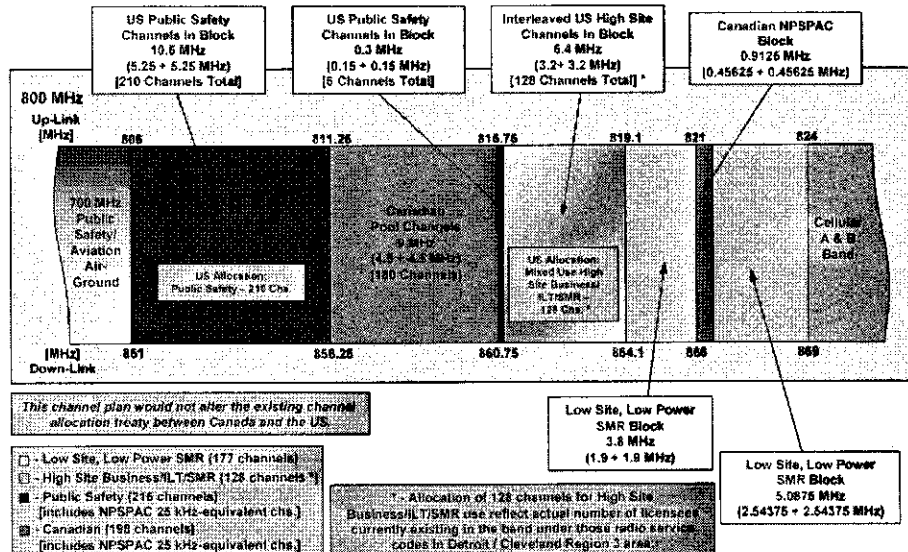
Annex C

Proposed Border Realignment Plan

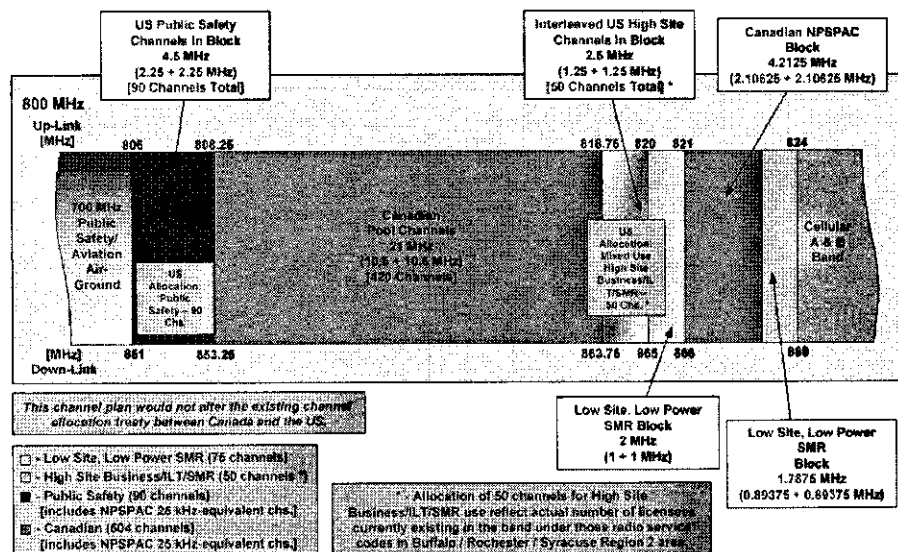
Sharing Zones I, II, III



Sector I



Sector II



Graphs taken from the "Supplemental Comments of the Consensus Parties" document filed on December 24, 2002, WT Docket No. 02-55